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Acerentomid Proturans from Sabah

by

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With 43 figures

ABSTRACT

The present article deals with the results of examination on the acerentomid proturans in the specimens of two collections from Sabah. It has been revealed that they comprise six forms, containing one new species, one new subspecies and three species new to Borneo. All the six are regarded as the members of the Asia elements dominated in the tropical and/or temperate areas.

Only one contribution, IMADATÉ (1965), had been published about the proturan fauna of Borneo before the present study was undertaken. Imadaté described nine species from Borneo; five eosentomids, *Eosentomon iban* from Sarawak and Brunei, *E. tankoktongi* from Brunei and Sabah (= North Borneo), *E. imbutum* from Sarawak, Brunei and Sabah, *E. gimangi* and *E. dusun* from Brunei, and four acerentomids, *Condeellum ishiianum* from Sabah, *Kenyentulus sanjianus* (= *Gracilentulus sanjianus*) from Brunei, *K. malaysiensis* (= *G. malaysiensis*) and *Silvestridia hutan* from Sarawak and Brunei.

This study is based on two proturan collections from Sabah; a large holding of materials in the collection of the Muséum d'Histoire naturelle, Genève, made by Dr. Bernd Hauser in 1982-1983; and my own collection made during the Osaka City University Scientific Expedition to Southeast Asia in 1968. It is with deep regret that I was unable to observe integumental pores adequately, since almost all the specimens were in bad condition.

The specimens used for the present work, including the holotypes, are to be deposited in the collection of the Muséum d'Histoire naturelle, Genève, and also in the collection of the National Science Museum (Nat. Hist.), Tokyo.

I wish to express my hearty thanks to Dr. Bernd Hauser, Muséum d'Histoire naturelle, Genève, for the long-term loan of his valuable collection of proturans from Sabah and for taking trouble to publish the present article, to all the staff of the Osaka

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City University Scientific Expedition to Southeast Asia in 1965 for their unfailing help. My sincere thanks are also due to Dr. Shun-Ichi Uéno for kindly reading the original manuscript and giving valuable criticism, to Professor Bruno Condé and Professor Riozo Yoshii for offering their professional suggestion and to Professor Yin Wen-Ying for providing me with the opportunity to examine the Tibetan specimens of *Condeellum ishiianum* in her collection.

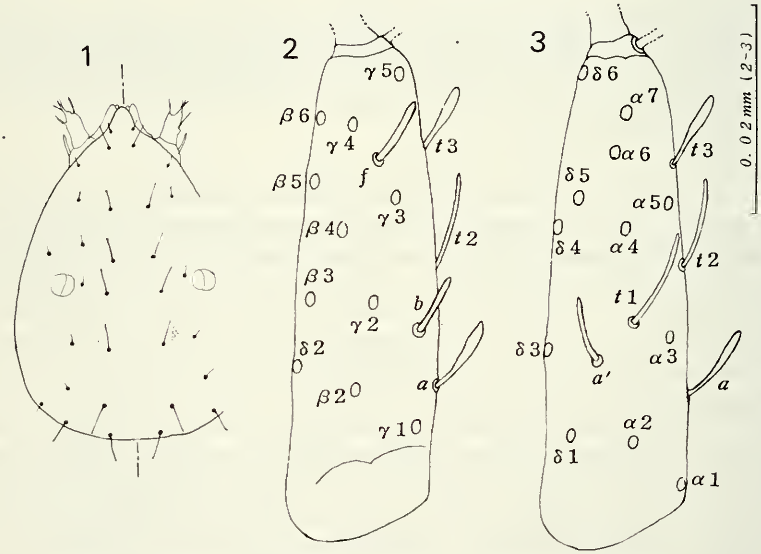
Suborder ACERENTOMOIDEA Condé, 1951

Family PROTENTOMIDAE Ewing, 1936

Condeellum ishiianum setosum subsp. nov.

Condeellum ishiianum Imadaté, 1965, Nature & Life in SE Asia, 4: 247-252 [in part].
Condeellum ishiianum: TUXEN & YIN, 1982, Steenstrupia, 8: 230-234 [in part].

Specimens examined. 2♀, Tanjong Aru, Kota Kinabalu, West Coast Residency, 4-III-1962, collected by G. Imadaté leg; 1♀, Langanan Trail (600 m alt.), Mt. Kinabalu, West Coast Residency, 21-III-1983, collected by B. Hauser.



FIGS 1-3.

Condeellum ishiianum setosum subsp. nov. — 1. Head, dorsal view. Dotted lines show the position of the canal of maxillary gland. 2. Foretarsus, exterior view. 3. The same, interior view.

Body length 680-780 µm.

Head oval, 92-104 µm (Fig. 1). Labrum a little protruded. Additional setae absent. Maxillary palpus with two pointed sensillae. Labial palpus without sensilla. Pseudoculus almost circular. about 8 μm in length, PR = 12-13. Distinct heart-shaped dilatation present on the canal of maxillary gland.

Foretarsus relatively short and clumsy (Figs 2-3), 46-48 μm, TR = 2.6-2.7; empodium short, EU = 0.11; S-shaped setae subequal to 2/3 of the claw in length. The position and shape of foretarsal sensillae and setae are similar to those of the nominotypical form, BS = 0.84-0.89; ventral seta β1 invisible. Middle tarsus 19-21 μm, hind one 21-23 μm, their claws 14-15 μm.

Table 1.

Chaetotaxy of *Condeellum ishiianum setosum* subsp. nov.

	Dorsal		Ventral	
	Formula	Composition of setae	Formula	Composition of setae
Thorax I	6	1, 1a, 2	$\frac{4-4}{6}$	A 1, 2, M 1, 2 P 1, 2, 3
II	$\frac{6}{14}$	M, A 2, 4 P 1, 1a, 2, 2a, 3, 4, 5	$\frac{6-2}{4}$	A 1, 2, 3, M P 1, 2
III	$\frac{6}{14}$	M, A 2, 4 P 1, 1a, 2, 2a, 3, 4, 5	$\frac{8-2}{4}$	A 1, 2, 3, 4, M P 1, 2
Abdomen I	$\frac{6}{12}$	A 1, 2, 5 P 1, 1a, 2, 2a, 3, 5	$\frac{4}{4}$	A 1, 2 P 1, 2
II-III	$\frac{6}{16}$	A 1, 2, 5 P 1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{4}{6}$	A 1, 2 P 1, 1a, 2
IV-VI	$\frac{6}{16}$	A 1, 2, 5 P 1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{4}{9}$	A 1, 2 P c, 1, 1a, 2, 3
VII	$\frac{6(8)}{18}$	A 1, (2), 4, 5 P 1, 1a, 2, 2a, 3, 3a, 4, 4a, 5	$\frac{4}{9}$	A 1, 2 P c, 1, 1a, 2, 3
VIII	$\frac{6}{14}$	A 1, 3, 5 P 1, 1a, 2, 3a, 4, 4a, 5	6	1, 1a, 2
IX	14	1, 1a, 2, 2a, 3, 4, 5	6	1, 1a, 2
X	12	1, 2, 2a, 3, 4, 5	4	
XI	8	1, 2, 2a, 3	6	
Telson	9		8	

Chaetotaxy as shown in Table 1 and Fig. 4. Thorax I with three pairs of dorsal setae, 1, 1*a* and 2, and seven pairs of ventral setae, A 1, 2, M 1, 2, P 1, 2 and 3. Thoraces II-III with seven pairs of dorsal posterior setae, P 1, 1*a*, 2, 2*a*, 3, 4 and 5. Abdominal tergites II-VI with three pairs of anterior setae, A 1, 2 and 5; terg. VII with A 1 (2), 4 and 5; sternites II-III with four posterior setae; stern. IV-VII with nine posterior setae; stern. VIII-IX with six setae, 1, 1*a* and 2. Accessory setae, dorsal 1*a* and ventral A 2 on thorax I, dorsal P 1*a*, 2*a* and ventral A 2 on th. II, dorsal P 1*a*, 2*a*, 5 and ventral A 2, A 5, P 1*a* and 2*a* on abdominal tergite I, P 2*a* and 4*a* on terg. II-VII, 4*a* on terg. VIII, P 2 on sternite I, P 1*a* on stern. II-VI extremely short, club-shaped, less than 2 µm in length; dorsal P 5 on th. III minute, rudimentary; P 1*a* on terg. II-VI and P 1*a* on stern. VII short and seta-shaped, 5 µm long, a little longer than 2/3 of P 1 length; P 1*a* and 3*a* on terg. VII, 1*a* on stern. VIII-IX seta-shaped, 6-7 µm in length; on stern. IV-VII, P c 11-12 µm long, subequal to P 1 in length. Dorsal P 1, 1*a* and 2 on th. III 9 µm, 2 µm and 16 µm; 1, 1*a* and 2 on stern. VIII 11-12 µm, 7 µm and 19-20 µm; 1, 1*a* and 2 on stern. IX 11 µm, 7 µm and 18 µm; 1 and 2 on stern. X 7 µm and 16 µm.

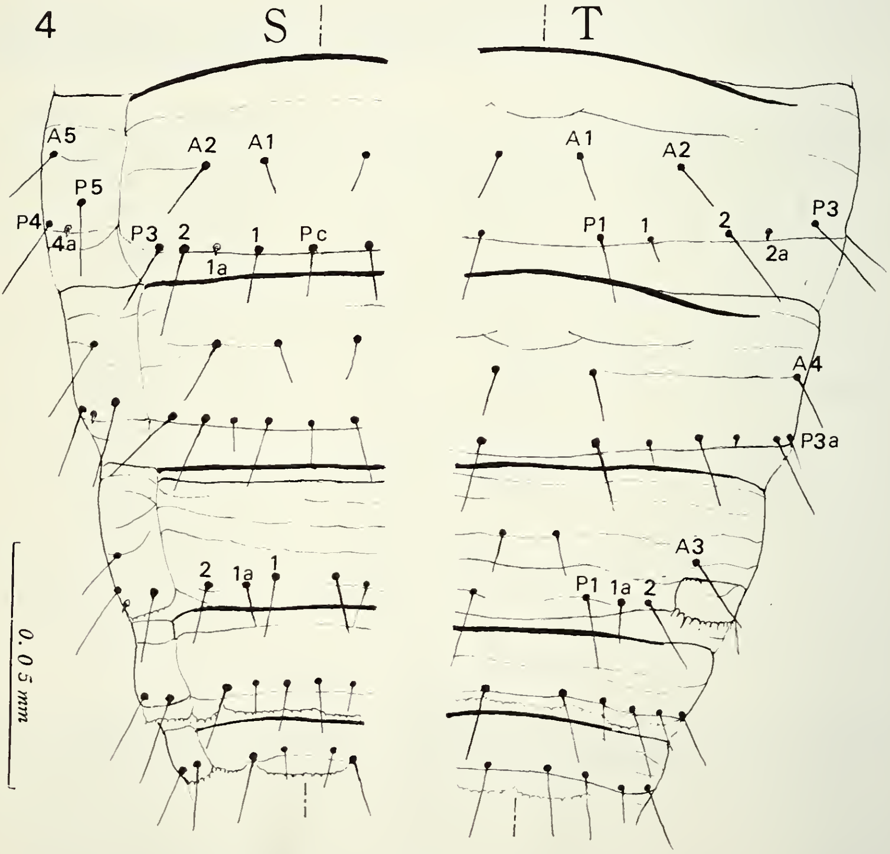


FIG. 4.

Condeellum ishiianum setosum subsp. nov.; chaetotaxy of abdomen VI-X; S, sternite; T, tergite.

Abdominal appendages I-II with four setae and terminal vesicle; III with three setae and without terminal vesicle. On abd. VIII, striate band absent; only a single line with minute serrations present; comb consisting of about ten posterior teeth of irregular size and a few minute inner anterior teeth. Lateroposterior margin of terg. VIII-X and posterior margin of stern. IX-X with minute serrations. Th. II-III, abd. I-VII and IX-X with a few transverse lineations in anterior part; abd. VIII with complicate lineations. Female squama genitalis with apically pointed acrostylus.

Holotype: ♀, Langanan Trail (600 m alt.), Mt. Kinabalu, West Coast Residency, Sabah, 21-III-1983, collected by B. Hauser.

Notes. The present new subspecies is closely similar to the nominotypical form, *C. ishiianum ishiianum,* except for the presence of anterior setae A 1 (or A 1 and 2, as mentioned in TUXEN & YIN, 1982, p. 235) on abdominal tergite VII and the presence of 1*a* on sternite IX, though asymmetric absence of the latter is observed in two females from Tanjong Aru. The difference between the present and nominotypical forms is not wide, but I prefer to regard them as two distinctive races separated geographically, since the former is known from Borneo and the latter from the northern part of Thailand and the southwestern part of China (YIN, 1987). In the original description of the nominotypical form (IMADATÉ, 1965, pp. 247-252), I overlooked the presence of the ventral setae, A 2 and M 2 on thorax I and dorsal P 5 on thoraces II-III, and I failed in interpreting P 5 and A 5 on abdominal tergite I as P 4*a* and 5 (cf. TUXEN & YIN, 1982, Table 1). Those chaetotaxial formulae are amended to 14 (4-4/6), 20 (6/14) and 6/12, respectively.

Distribution. Borneo (Sabah).

Family ACERENTOMIDAE Silvestri, 1907

Baculentulus morikawai (Imadaté et Yosii, 1956)
(Figs 5-8)

Acerentulus morikawai Imadaté et Yosii, 1956, Ins. matsum., 20: 14-16.

Berberentulus morikawai: TUXEN, 1963, Ent. Medd., 32: 97; IMADATÉ, 1974, Fauna Japonica, Protura, 195-204.

Baculentulus morikawai: TUXEN, 1977, Rev. Écol. Biol. Sol, 14: 602; IMADATÉ, 1989, AZAO, 1: 100-103.

Other references are omitted.

New specimens examined. 1♀, Keningau, Interior Residency, 1-IX-1968, collected by G. Imadaté; 14♀, 8 maturus juniors, 7 larva II, 3 larva I, Sepilok, Sandakan Residency, 7-V-1982, collected by B. Hauser.

Brief notes on the Sabah specimens are given in the following lines.

Imago. Head without additional setae. Foretarsus 88-95 μm, BS = 0.47-0.49.

Maturus junior. Foretarsus 74-77 μm, BS = 0.48-0.49. P 2 on abdominal sternite I is missing. On tergites II and V-VII, symmetric or asymmetric absence of P 1*a* is frequently observed.

Larva II. Foretarsus 58-62 μm, BS = 0.46-0.48. On telson, dorsal anterior setae are often absent. Asymmetric presence of P 4*a* on abd. terg. II-III is found in one specimen, and asymmetric absence of P 2*a* on terg. VI in a different one.

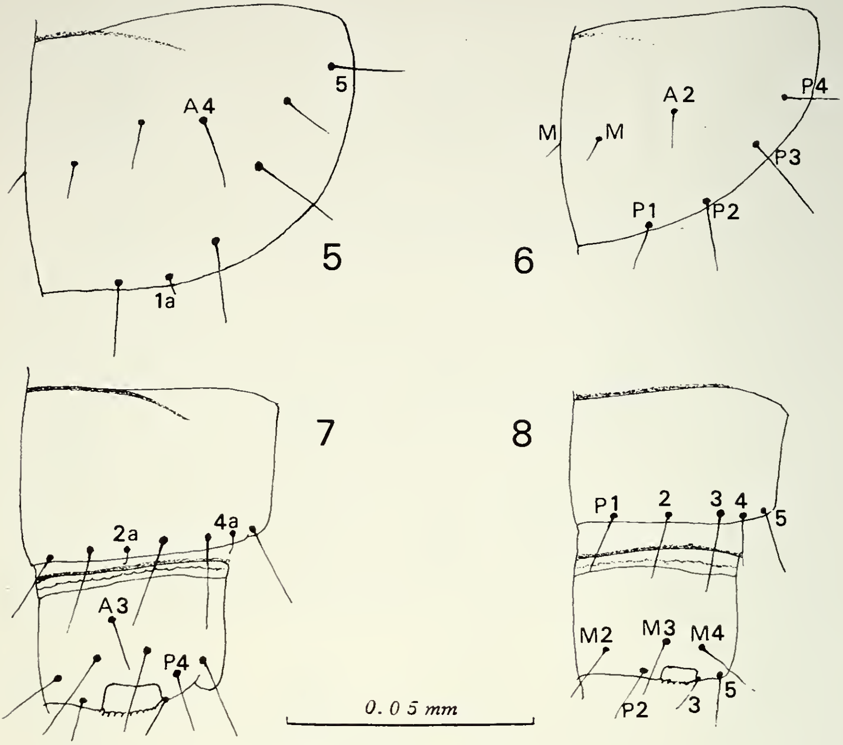
Larva I. Foretarsus 47-49 μm, BS = 0.45-0.49, interior sensilla *c'* invisible.

TABLE 2.

Chaetotaxy of *Baculentulus morikawai* from Sabah

		Larva I		Larva II		Maturus junior		Imago	
		Formula	Primary setae	Formula	Secondary setae	Formula	Tertiary setae	Formula	Complementary setae
		(Dorsal)							
Thorax	I	4		4		4		4	
	II-III	$\frac{4}{8}$	A 2, M P 1, 2, 3, 4	$\frac{6}{12}$	A 4 P 1a, 5	$\frac{6}{16}$	P 2a, 5a	$\frac{6}{16}$	
Abdomen	I	$\frac{0}{8}$	P 1, 2, 3, 5	$\frac{0}{10}$	P 2a	$\frac{6}{10}$	A 1, 2, 5	$\frac{6}{12}$	P 1a
	II-III	$\frac{0}{10}$	P 1, 2, 3, 4, 5	$\frac{0}{12}$	P 2a	$\frac{6}{14(16)}$	A 1, 2, 5 P 4a, (1a)	$\frac{6}{16}$	(P 1a)
	IV-V	$\frac{0}{10}$	P 1, 2, 3, 4, 5	$\frac{0}{14}$	P 2a, 4a	$\frac{6}{14(16)}$	A 1, 2, 5 (P 1a)	$\frac{6}{16}$	(P 1a)
	VI	$\frac{0}{10}$	P 1, 2, 3, 4, 5	$\frac{0}{14}$	P 2a, 4a	$\frac{6}{14(16)}$	A 1, 2, 5 (P 1a)	$\frac{8}{16}$	A 4 (P 1a)
	VII	$\frac{0}{10}$	P 1, 2, 3, 4, 5	$\frac{0}{14}$	P 2a, 4a	$\frac{6}{14(16)}$	A 2, 4, 5 (P 1a)	$\frac{6}{16}$	(P 1a)
	VIII	$\frac{0-6}{6}$	M 2, 3, 4 P 2, 3, 5	$\frac{2-6}{8}$	A 3 P 4	$\frac{6-7}{8}$	A 1, 5, M c	$\frac{6-8}{8}$	M 1, −M c
	IX			8	1, 3, 4, 5	12	2, 3a	14	4a
	X					8	1, 3, 4, 5	12	2, 3a
	XI					6		6	
Telson		9		9		9		9	

		(Ventral)							
Thorax	I	$\frac{2-2}{4}$	A 1, M 1 P 1, 2	$\frac{2-2}{4}$		$\frac{4-4}{6}$	A 2, M 2 P 3	$\frac{4-4}{6}$	
	II-III	$\frac{5-0}{2}$	A c, 2, 3 P 1	$\frac{5-2}{2}$	M	$\frac{7-2}{4}$	A 4 P 2	$\frac{7-2}{4}$	
Abdomen	I	$\frac{0}{2}$	P 1	$\frac{3}{2}$	A c, 2	$\frac{3}{2}$		$\frac{3}{4}$	P 2
	II-III	$\frac{0}{3}$	P c, 3	$\frac{1}{5}$	A c P 2	$\frac{3}{5}$	A 2	$\frac{3}{5}$	
	IV-VII	$\frac{1}{4}$	A c P 2, 3	$\frac{1}{6}$	P 1	$\frac{3}{8}$	A 2 P 1a	$\frac{3}{8}$	
	VIII	$\frac{2}{0}$	2	$\frac{4}{0}$	1	$\frac{4}{0}$		$\frac{4}{0}$	
	IX			4		4		4	
	X					4		4	
	XI					2	2	6	1, 3
Telson		8	A, P 1, 2, 3	6 (8)	(– A)	6	(– A)	6	



FIGS 5-8.

Baculentulus morikawai from Sabah. — 5 and 7. Larva II. 6 and 8. Larva I. 5 and 6. Dorsal chaetotaxy of thorax III. 7 and 8. Chaetotaxy of abdominal tergites VII-VIII.

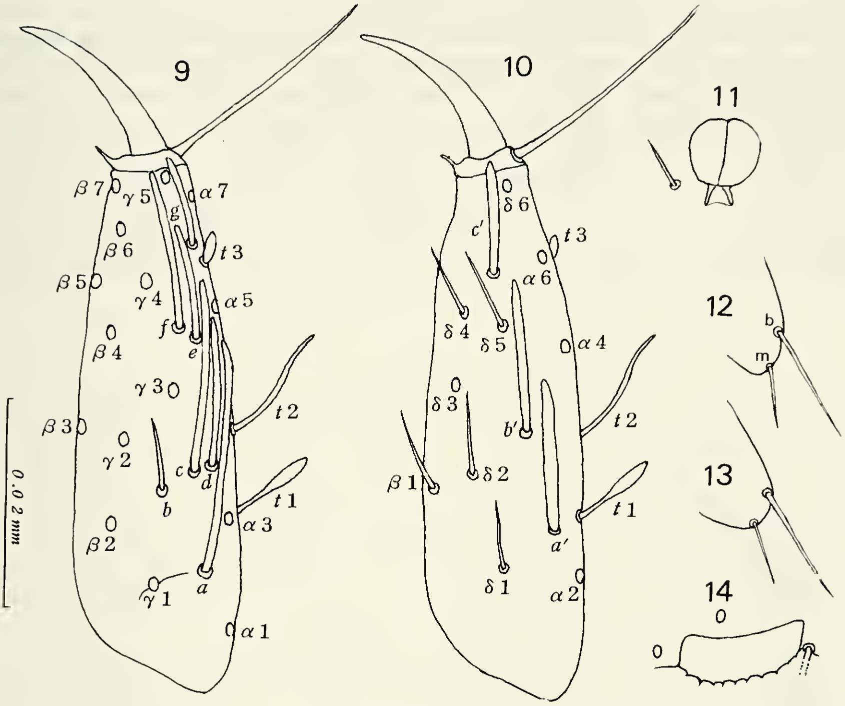
Notes. From the other populations of *B. morikawai,* no significant difference is found in the fundamental characteristics such as foretarsal sensillae, mouth-parts, etc., and in the chaetotaxial development through all the stages between larva I and imago (Table 2 and Figs 5-8), in the Sabah specimens.

Distribution. Japan, Korea, China, Formosa, Thailand, Malaya, Singapore, India, Nepal, Seychelles, and new to Borneo (Sabah).

Kenyentulus yayukae Imadaté, 1989
(Figs 9-14)

Kenyentulus yayukae Imadaté, 1989, AZAO, 1: 103-108.

New specimens examined. 1♀, 1 mj, Tataluan, Pensiangan, Interior Residency, 21-VIII-1968, collected by G. Imadaté; 1 mj, Keningau, Interior Residency, 1-IX-1968, collected by G. Imadaté; 1♀, Sepilok, Sandakan Residency, 10-V-1982, collected by B. Hauser; 1♂, 3♀, Kimanis Road (16 miles from Keningau), Interior Residency, 14-III-1982, collected by B. Hauser.



FIGS 9-14.

Kenyentulus yayukae from Sabah. — 9. Foretarsus, exterior view. 10. The same, interior view. 11. Pseudoculus. 12. Abdominal appendage II; b, subapical seta; m, median apical seta. 13. Abdominal appendage III. 14. Comb on abdomen VIII.

Supplementary notes on the Sabah specimens. Head without additional seta. Pseudoculus circular, with distinct lids, PR = 12-15. Foretarsus 51-53 µm, TR = 2.8-3.0; BS = 0.45-0.49; S-shaped seta a little longer than the claw. The position and shape of foretarsal sensillae (Figs 9-10) are closely similar to those of the Javanese specimens, though the exterior sensilla *a* is slightly longer than that of the latter.

Chaetotaxy same as that of the Javanese population. Dorsal P 1*a* and 2*a* on thoraces II-III short, less than 2 µm in length; dorsal P 5*a* on th. II minute; that on th. III rudimentary; ventral A 2 on th. I-III; A 5, P 1*a* and 2*a* on abdominal tergite I, P 1*a*, 2*a* and 4*a* on terg. II-VII, P 2 on sternites I-III, P 1*a* on stern. IV-VII sensilla-like, less than 5 µm. Dorsal P 1 and 2 on th. III 10 µm and 16-18 µm; P 1, 1*a* and 2 on abd. terg. VI 15-17 µm, 3-4 µm and 18-19 µm; 1 and 2 on stern. IX 7 µm and 18-20 µm; 1 and 2 on stern. X 7 µm and 20-22 µm. In one female from Tataluan one of P 1*a'* on terg. VI exists found and 2 on stern. XI is absent. Abdominal appendages II-III with two setae, a long subapical, about 12 µm in length, and a short median apical, less than 6 µm in length, respectively. Comb on abdomen VIII with 8-10 small teeth.

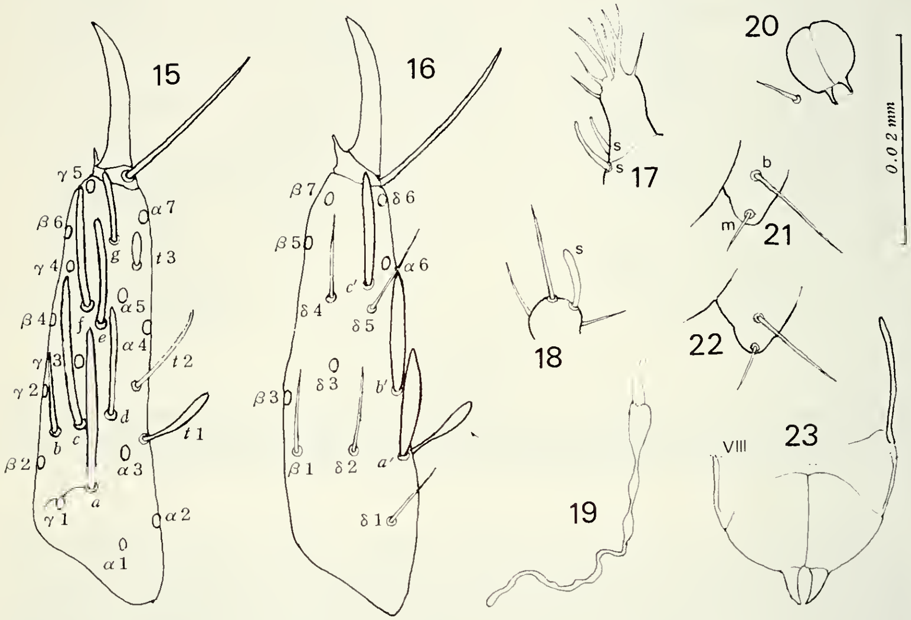
Maturus junior. Foretarsus 43-47 µm, TR = 2.8-2.9. Both the two specimens examined have no setae 2 on stern. XI.

Notes. The present species is characterized by the long foretarsal sensilla *a* fairly surpassing the base of γ 3, and long *c* reaching the base of γ 4. Slight differences are found in the relative length of body setae and foretarsal sensillae between the Javanese and Sabah specimens. These can be regarded as local variation within the species.

Distribution: Java, and new to Borneo (Sabah).

Kenyentulus hauseri sp. nov.
(Figs 15-25)

Specimens examined. 15♀, Kimanis Road (16 miles from Keningau), Interior Residency, 14-III-1983, collected by B. Hauser.



FIGS 15-23.

Kenyentulus hauseri sp. nov. — 15. Foretarsus, exterior view. 16. The same, interior view. 17. Maxillary palpus; s, sensilla. 18. Labial palpus. 19. Canal of maxillary gland. 20. Pseudoculus. 21. Abdominal appendage II; b, subapical seta; m, median apical seta. 22. Abdominal appendages III. 23. Female squama genitalis; VIII, abdomen VIII.

Body 390-400 μm is unexpanded specimens. Head oval, 80-85 μm in dorsal view. Additional setae absent. Maxillary palpus with two slender sensillae on penultimate segment. Labial palpus rudimentary, with three setae and one sensilla. Pseudoculus circular, with two distinct lids posteriorly, PR = 14-15. Canal of maxillary gland very long, with two or three additional dilatations on the proximal part.

Foretarsus (Figs 15-16) 38-41 μm, claw slender, TR = 2.9-3.1; empodium short, EU = 0.13-0.15; S-shaped seta a little longer than the claw in length. Dorsal sensilla *t 1* claviform, BS = 0.52-0.56; *t 2* thin; *t 3* small. Exterior sensillae *a, c, d, e, f, g* slightly thick; *a* long, its apex reaching the base of *e; b* short, slightly surpassing the base of γ 3; *c* long, its apex almost reaching the base of γ 4; *d* fairly surpassing the base of *e; e* very close to *f; f* a little longer than *e,* its apex reaching the base of γ 5; *g* surpassing the tarsus. Interior sensillae *a', b'* and *c'* broadened; *a'* almost at the same level as *t 1; b'* at the same level as *t 2,* its apex reaching the base of *c'*; *c'* reaching the base of the claw. Ventral seta β 1 and interior seta δ 4 thin and short, less than 8 μm in length, respectively. Middle tarsus 17-18 μm, hind one 19-21 μm, their claws 12-13 μm.

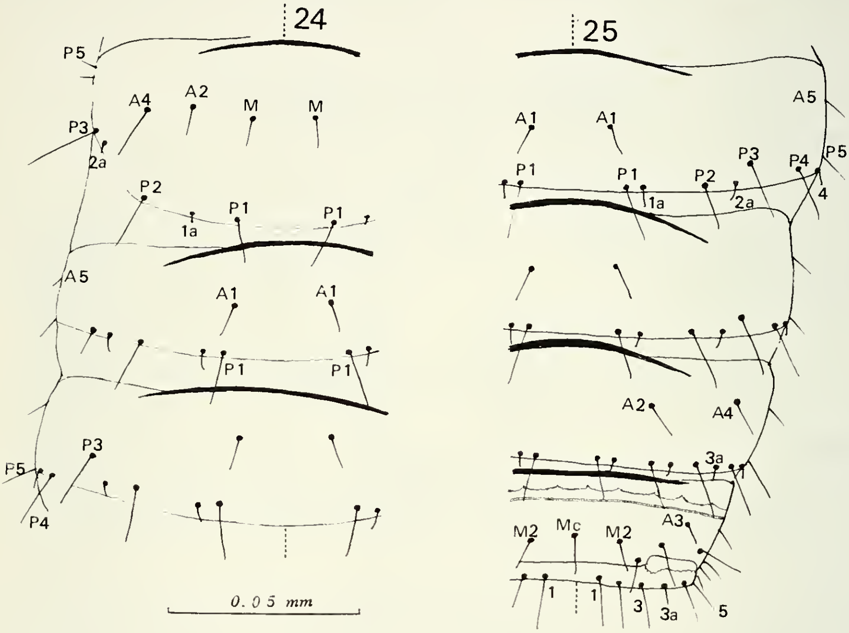
TABLE 3.

Chaetotaxy of *Kenyentulus hauseri* sp. nov.

	Dorsal		Ventral	
	Formula	Composition of setae	Formula	Composition of setae
Thorax I	4		$\frac{4-2}{6}$	A 1, 2, M 1 P 1, 2, 3
II-III	$\frac{6}{16(14)}$	M, A 2, 4 P 1, 1a, 2, 2a, 3, 4, 5, (5a)	$\frac{5-2}{4}$	A c, 2, 3 P 1, 2
Abdomen I	$\frac{4}{12}$	A 1, 5 P 1, 1a, 2, 2a, 3, 5	$\frac{3}{4}$	A c, 2 P 1, 2
II-III	$\frac{4}{16}$	A 1, 5 P 1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{3}{5}$	A c, 2 P c, 2, 3
IV-VI	$\frac{4}{16}$	A 1, 5 P 1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{3}{8}$	A c, 2 P 1, 1a, 2, 3
VII	$\frac{6}{18}$	A 2, 4, 5 P 1, 1a, 2, 2a, 3, 3a, 4, 4a, 5	$\frac{3}{8}$	A c, 2 P 1, 1a, 2, 3
VIII	$\frac{4-7}{8}$	A 3, 5, M c, 2, 3, 4 P 2, 3, 4, 5	4	
IX	12	1, 2, 3, 3a, 4, 5	4	
X	10	1, 2, 3, 4, 5	4	
XI	6		6 (4)	1, (2), 3
Telson	9		6	

Chaetotaxy as shown in Table 3, Figs 24-25. Thorax I without ventral M 2; th. II-III each with two pairs of dorsal anterior setae, A 2 and 4, and five ventral anterior setae, A *c,* 2 and 3. Abdominal tergites I-VI each with two pairs of anterior setae, A 1 and 5;

terg. VII with three anterior pairs, A 2, 4 and 5; terg. VIII with two anterior pairs, A 3 and 5. On terg. II-VI, P 3 situated a little anterior to the other posterior setae. Dorsal P 1*a* and 2*a* on th. II-III extremely short, about 1 µm in length; dorsal P 5*a* on th. II minute; that on th. III rudimentary; ventral A 2 on th. I-III, P 1*a* and 2*a* on abd. terg I, P 1*a*, 2*a* and 4*a* on terg. II-VI, P 1*a*, 2*a*, 3*a* and 4*a* on terg. VII, P 2 on stern. I-III, P 1*a* on stern. IV-VII short and sensilla-like, less than 4 µm in length. Dorsal P 1 and 2 on th. III 7-8 µm and 10 µm; P 1, 1*a* and 2 on abd. terg. VI 11-12 µm, 3-4 µm and 12-14 µm; 4 and 5 on terg. X 12-13 µm and 10-12 µm; 1 and 2 on stern. IX 6 µm and 15-16 µm; 1 and 2 on stern. X 6 µm and 15-18 µm.



FIGS 24-25.

Kenyentulus hauseri sp. nov. — 24. Dorsal chaetotaxy, thorax III-abdominal tergite II. 25. The same, abd. terg. V-IX.

Abdominal appendages II-III each with two setae, one long subapical, 10-11 µm in length, one short median apical, less than 4 µm in length. On abdomen VIII, striate band reduced, with minute striae only visible on the posterior margin; comb consisting of about ten small teeth. Female squama genitalis with sharply pointed acrostylus.

Holotype: ♀, Kimanis Road (16 miles from Keningau), Interior Residency, 14-III-1982, collected by B. Hauser.

Notes. The present form is related to the former species, *K. yayukae.* They are closely similar to each other in the position and shape of foretarsal sensillae, especially in such characteristics as the long exterior *a* and *c*, the broadened interior *a'*, *b'* and *c'*, the ratios TR and BS, though the former is different from the latter in the absence of the anterior pair, A 2, on abdominal tergites I-VI and in the relative length of exterior sensilla *b*. The apex of *b* slightly surpasses the base of γ 3 in the present new species, while it does not reach the base of γ 3 in *K. yayukae*.

Chaetotaxial abnormality is presumably rare in *K. hauseri*. One female has an extra dorsal P 1' on thorax III and one of A 1 on abd. terg. VIII. In another female, one of 1 on stern. VIII is lacking.

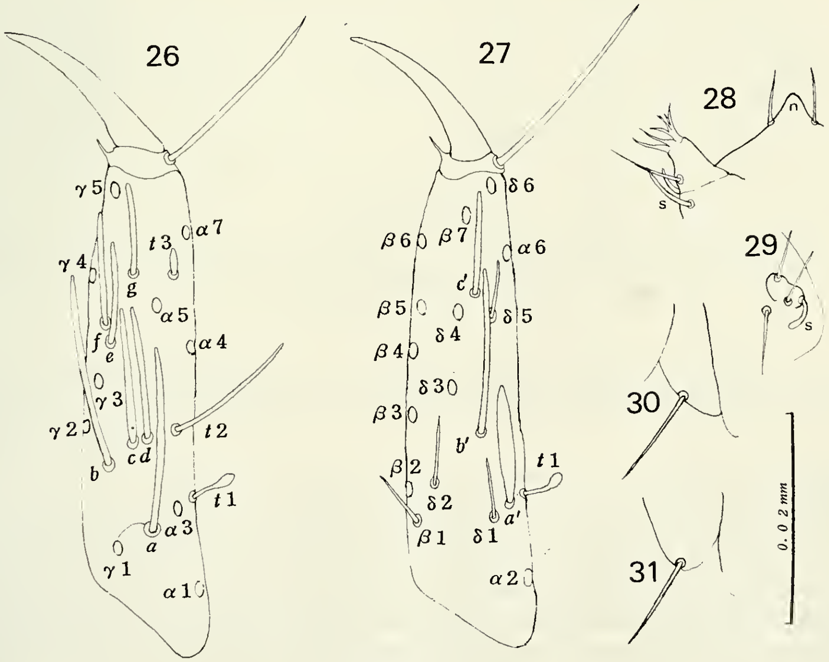
The present new species is named in honor to Dr. Bernd Hauser, Muséum d'Histoire naturelle, Genève, who has tirelessly surveyed the soil fauna in tropical Asia for many years, and kindly submitted his valuable materials from Sabah, including the type specimen of this new species, to my inspection.

Distribution. Borneo (Sabah).

Silvestridia hutan Imadaté, 1965
(Figs 26-32)

Silvestridia hutan Imadaté, 1965, Nature & Life in SE Asia, 4: 298-300.

S. hutan: TUXEN & IMADATÉ, 1974, Ent. scand., 5: 88-91; CONDÉ, 1976, Rev. Écol. Biol. Sol, 13: 521-524; TUXEN, 1978, Ent. scand., 9: 260; 1980, Rev. Écol. Biol. Sol, 17: 440; IMADATÉ, 1989, AZAO, 1: 109-113.



FIGS 26-31.

Silvestridia hutan from Sepilok, Sabah. — 26. Foretarsus, exterior view. 27. The same, interior view. 28. Forepart of head and maxillary palpus; n, "snout"; s, sensilla. 29. Labial palpus; s, sensilla. 30. Abdominal appendage II. 31. Abdominal appendage III.

Other references are omitted.

New specimens examined. 9♀, Sepilok, Sandakan Residency, 7-V-1982, collected by B. Hauser; 6♀, ditto, 12-III-1983, collected by B. Hauser.

Description of the Sabah specimens from Sepilok: Head without additional seta; "snout" small, a little protruded, 2-3 µm in length. Pseudoculus circular, PR = 14-16. Maxillary palpus with two slender sensillae on penultimate segment; labial palpus with two setae and a sausage-shaped sensilla.

TABLE 4.

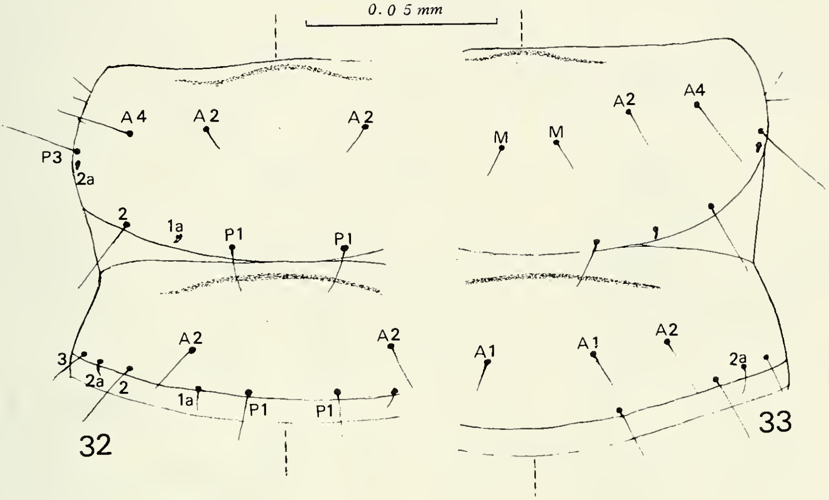
Chaetotaxy of *Silvestrida hutan* from Sabah

	Dorsal		Ventral	
	Formula	Composition of setae	Formula	Composition of setae
Thorax I	4		$\frac{4-4}{4(6)}$	A 1, 2, M 1, 2 P 1, 2, (3)
II-III	$\frac{4}{14(16)}$	A 2, 4 P 1, 1a, 2, 2a, 3, 4, 5, (5a)	$\frac{7-2}{4}$	A c, 2, 3, 4, M P 1, 2
Abdomen I	$\frac{4}{12}$	A 2, 5 P 1, 1a, 2, 2a, 3, 5	$\frac{3}{2}$	A c, 2 P 1
II-III	$\frac{4}{16}$	A 2, 5 P 1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{3}{5}$	A c, 2 P c, 2, 3
IV-VI	$\frac{4}{16}$	A 2, 5 P 1, 1a, 2, 2a, 3, 4, 4a, 5	$\frac{3}{8}$	A c, 2 P 1, 1a, 2, 3
VII	$\frac{2}{18}$	A 5 P 1, 1a, 2, 2a, 3, 3a, 4, 4a, 5	$\frac{3}{8}$	A c, 2 P 1, 1a, 2, 3
VIII	$\frac{4-7}{8}$	A 3, 5, M c, 2, 3, 4 P 2, 3, 4, 5	4	
IX-X	12	1, 2, 3, 3a, 4, 5	4	
XI	6		4	1, 3
Telson	9		6	

Foretarsus 44-46 µm (Figs 26-27), TR = 2.8-2.9. The position and shape of foretarsal sensillae are similar to those of the other populations of *S. hutan*; BS = 0.41-0.44; exterior sensilla *b* long, subequal to *a* in length, its apex reaching the base of γ 4; interior sensilla *b'* proximal to δ 3, its apex surpassing the base of *c'*; ventral seta β 1 thin and short, subequal to interior seta δ 1, 5 µm in length.

Chaetotaxy as shown in Table 4 and Fig. 32. Thoraces II-III without dorsal M; abdominal tergites I-VI with only two pairs of anterior setae, A 2 and 5, and without a 1;

terg. VII with a single anterior pair, A 5. Dorsal P 5*a* on thorax II minute; ventral P 3 on thorax I and dorsal P 5*a* on thorax III hardly visible; dorsal P 1*a* and 2*a* on thoraces II-III short and blunt, less than 3 μm in length; ventral A 2 and M 2 on thorax I, ventral A 2 on thoraces II-III, P 1*a,* 2*a,* A 5 on abdominal tergite I, P 1*a*, 2*a*, 4*a* on terg. II-VI, P 1*a*, 2*a*, 3*a*, 4*a* on terg. VII, P 2 on abd. sternites II-III, P 1*a* on stern. IV-VII short and sensilla-like, about 4 μm in length. Dorsal P 1, 1*a* and 2 on thorax III 10-12 μm, 2-3 μm and 17-18 μm, P 1, 1*a* and 2 on abd. terg. VI 19-22 μm, 4 μm and 21-23 μm, 4 and 5 on terg. X 7-8 μm and 9-10 μm, 1 and 2 on stern. IX 5-6 μm and 14-15 μm, 1 and 2 on stern. X 5-6 μm and 15-16 μm.



FIGS 32-33.

Dorsal chaetotaxy of thorax III and abdomen I. 32. *Silvestridia hutan* from Sepilok, Sabah. 33. *S. keijiana* from Sepilok, Sabah.

Abdominal appendages II-III with a single seta, long subapical, about 9 μm in length, respectively. Striate band on abdomen VIII reduced, but with distinct dispersed striae at the anterior margin.

Notes. It is noticeable that not only the pair of dorsal M on thoraces II-III but A 1 on abdominal tergite I are absent in all the specimens newly examined, as observed in those from Brunei and Sabah in the original description (IMADATÉ, 1965). It is likely that both the two pairs are absent in the Borneo populations, though the pairs are usually present in the specimens from the other places (CONDÉ 1976, TUXEN 1980, IMADATÉ 1989). I prefer to regard the difference as an example of local variations within the species.

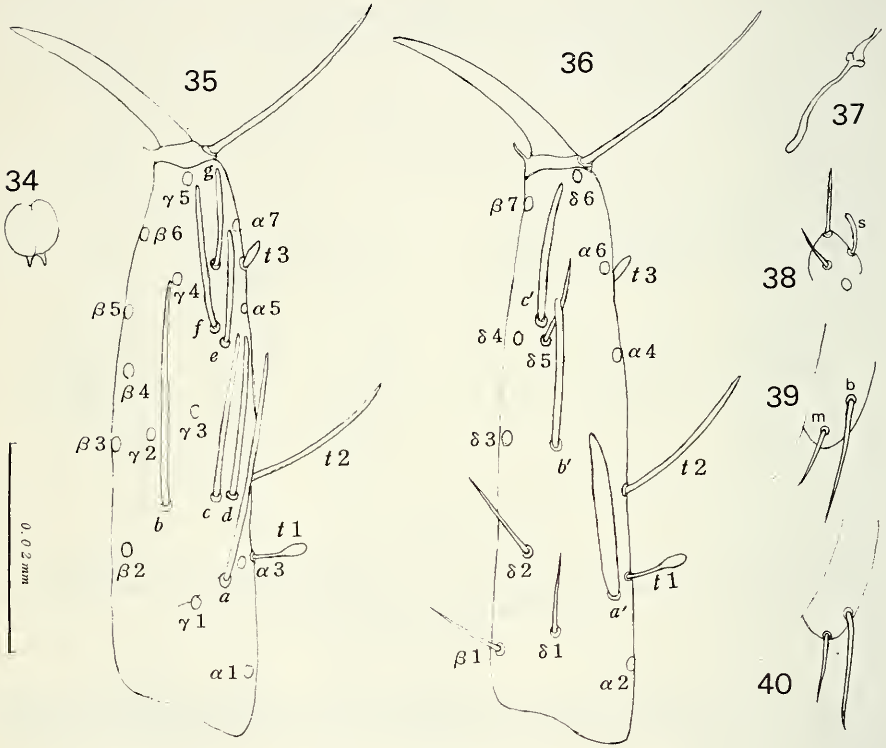
In IMADATÉ (1989), I erroneously described the distribution of *S. hutan* and the chaetotaxy of the Javanese specimens. They are amended as shown in the errata at the last part of the present text.

Distribution. Borneo (Brunei and Sabah), Java, Madagascar, Reunion, Seychelles and Japan.

Silvestridia keijiana (Imadaté, 1965)
(Figs 33-43)

Berberentulus keijianus Imadaté, 1965, Nature & Life in SE Asia, 4: 291-296.
Baculentulus keijianus: TUXEN, 1977, Rev. Écol. Biol. Sol, 14: 602-609.
Gracilentulus greensladei Tuxen & Imadaté, 1975, Bull. Br. Mus. nat. Hist., (Ent.), 31: 340-346.
Gracilentulus greensladei: PRABHOO, 1975, Orient. Ins., 9: 435.
Silvestridia keijianus [Sic]: TUXEN, 1981, Ent. scand. Suppl. 15: 135 & 139.

Specimens examined. 70♀, 24 mj, 4 LII, Sepilok, Sandakan Residency, 7-V-1982, collected by B. Hauser.



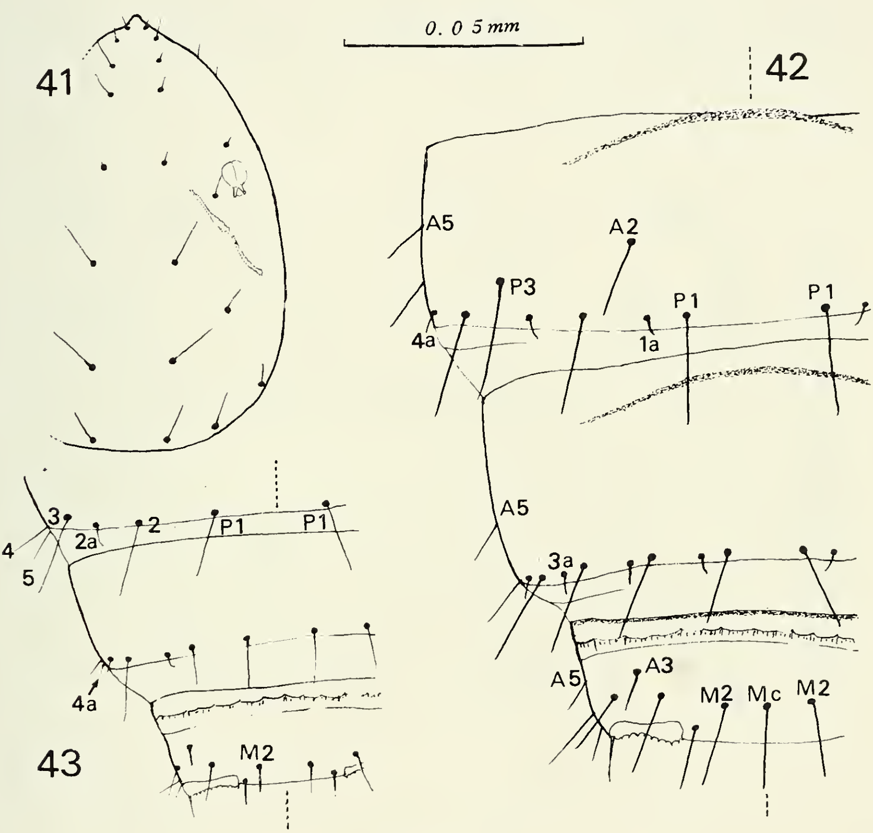
FIGS 34-40.

Silvestridia keijiana from Sabah. — 34. Pseudoculus. 35. Foretarsus, exterior view. 36. The same, interior view. 37. Canal of maxillary gland. 38. Labial palpus; s, sensilla. 39. Abdominal appendage II; b, subapical seta; m, median apical seta. 40. Abdominal appendage III.

On the basis of the new materials, supplementary notes will be given in the following lines.

Head without additional seta; "snout" small, a little protruded as in *S. hutan.* Pseudoculus circular, PR = 13-14. Canal of maxillary gland simple. Maxillary palpus with two slender sensillae on penultimate segment; labial palpus with two setae and a broadened sensilla.

Foretarsus 51-54 μm (Figs 35-36), claw slender, TR = 2.9-3.0; empodium short, EU = 0.11-0.13; S-shaped seta a little longer than the claw in length. The position and shape of foretarsal sensillae similar to those of the other populations of *S. keijiana*; BS = 0.41-0.45; exterior sensilla *b* long, subequal to *a* in length, its apex reaching the base of γ 4; interior sensilla *b'* surpassing the base of *c'*; ventral seta β 1 thin and short, about 7 μm, subequal to interior seta δ 1 in length. Middle tarsus 23-24 μm, hind one 25-26 μm, their claws 13-14 μm.



Figs 41-43.

Silvestridia keijiana from Sabah. 41. Dorsal chaetotaxy of head, imago. Dotted lines show the position of the canal of maxillary gland. 42. Chaetotaxy of abdominal tergites VI-VIII, imago. 43. The same, larva II.

Chaetotaxy as shown in Table 5, Figs 33 and 42. Thoraces II-III with dorsal M; abdominal tergite I with three pairs of anterior setae, A 1, 2 and 5; terg. II-VI with A 2 and 5; terg. VII with a single pair of A 5; abd. sternite I without P 2; stern. XI with only

TABLE 5.

Chaetotaxy of *Silvestridia keijiana* from Sabah

		Larva II		Maturus junior		Imago	
		Formula	Composition of setae	Formula	Tertiary setae	Formula	Complementary setae
		(Dorsal)					
Thorax	I	4		4		4	
	II-III	$\frac{6}{12}$	M, A 2, 4 P 1, 1a, 2, 3, 4, 5	$\frac{6}{14}$	P 2a	$\frac{6}{14(16)}$	(P 5a)
Abdomen	I	$\frac{0}{10}$	P 1, 2, 2a, 3, 5	$\frac{6(4)}{10}$	A 1, 2, (5)	$\frac{6}{12(10)}$	(P 1a)
	II-VI	$\frac{0}{12}$	P 1, 2, 2a, 3, 4, 5	$\frac{4}{14}$	A 2, 5 P 4a	$\frac{4}{16}$	P 1a
	VII	$\frac{0}{14}$	P 1, 2, 2a, 3, 4, 4a, 5	$\frac{2}{18}$	A 5 P 1a, 3a	$\frac{2}{18}$	
	VIII	$\frac{2-6}{8}$	A 3, M 2, 3, 4 P 2, 3, 4, 5	$\frac{4-7}{8}$	A 5, M c	$\frac{4-7}{8}$	
	IX	8	1, 3, 4, 5	10	2	12	3a
	X			8	1, 3, 4, 5	12	2, 3a
	XI			6		6	
Telson		9		9		9	

		(Ventral)					
Thorax	I	$\frac{2-2}{4}$	A 1, M 1 P 1, 2	$\frac{4-4}{6}$	A 2, M 2 P 3	$\frac{4-4}{6}$	
	II-III	$\frac{5-2}{4}$	A c, 3, 4 P 1, 2	$\frac{7-2}{4}$	A 2	$\frac{7-2}{4}$	
Abdomen	I	$\frac{3}{2}$	A c, 2 P 1	$\frac{3}{2}$		$\frac{3}{2}$	
	II-III	$\frac{1}{3}$	A c P c, 3	$\frac{3}{3}$	A 2	$\frac{3}{5}$	P 2
	IV-VII	$\frac{1}{6}$	A c P 1, 2, 3	$\frac{3}{8}$	A 2 P 1a	$\frac{3}{8}$	
	VIII	4		4		4	
	IX	4		4		4	
	X			4		4	
	XI			0		4	1, 3
Telson		6		6		6	

two pairs of setae, 1 and 3, without 2. Dorsal P 1*a* and 2*a* on thoraces II-III short and blunt, less than 3 µm in length; dorsal P 5*a* on thorax II minute; that on thorax III rudimentary; ventral A 2 and M 2 on thorax I, ventral A 2 on thoraces II-III, P 1*a, 2a* and A 5 on abd. terg. I, P 1*a,* 2*a* and 4*a* on terg. II-VI, P 1*a,* 2*a,* 3*a* and 4*a* on terg. VII, P 2 on stern. II-III, P 1*a* on stern. IV-VII short, sensilla-like, 4-6 µm in length. Dorsal P 1, 1*a* and 2 13-15 µm, 3 µm and 20-22 µm; P 1, 1*a* and 2 on abd. terg. VI 24-26 µm, 4-5 µm and 25-26 µm; 4 and 5 on terg. IX 10-12 µm and 10-12 µm; 4 and 5 on terg. X 10-11 µm and 11-12 µm; 1 and 2 on stern. IX 7-8 µm and 18-19 µm; 1 and 2 on stern. X 8-9 µm and 18-19 µm.

Abdominal appendages II-III with two setae, one long subapical, 10-11 µm in length, one short median apical, 4-5 µm in length, respectively. On abdomen VIII, striate band reduced, but with distinct dispersed striae at the anterior margin; comb concave, with about ten small teeth.

Maturus junior. Foretarsus 45-47 µm, BS = 0.41-0.45. In a specimen, one of A 1 on abd. terg. I lacking.

Larva II. Foretarsus 40-43 µm, BS = 0.42-0.45; interior sensilla *b’* missing. Striae in band on abdomen VIII fainter than those of the adult.

Notes. This species is characterized by the presence of two setae, one long subapical and one short median apical, on abdominal appendages II-III, among the members of the genus *Silvestridia.* The Sabah specimens differ from the other populations of *S. keijiana* in the relative length of foretarsal sensillae *a* and *b’,* the absence of P 2 on abdominal sternite I and of setae 2 on stern. XI, etc. It is likely that these are not specific but locally variable within the species.

In the Sabah specimens, chaetotaxial variations on the first three abdominal segments are often observed. Seta A *c* on sternite II is lacking in two larva II specimens, and that on stern. III is missing in one larva II. One maturus junior has P 2 on stern. II-III, while one female has no P 2 on those sternites, and another female has only one of P 2 on stern. II. The pair of P 1*a* on terg. I is lacking in fourteen females, and one of the pair on the same tergite is not found in seven females. In a different female one of A 1 on terg. I is absent.

Distribution. Thailand, Malaya, Singapore, Solomon and Bismarck Islands, India, and new to Borneo (Sabah).

ERRATA

Errors about *Silvestrida hutan* in Imadaté (1989) are as follows:

Page 111, line −1.	Bormeo, Java and Japan read Borneo, Java, Madagascar, Reunion, Seychelles and Japan
Page 113, Table 3, line 2.	7-2/7 (ventral) read 7-2/4
line 4.	P 1, 1a, 2, 2a, 3, 4, 5 (dorsal) read P 1, 1a, 2, 2a, 3, 5
line 5.	P 1, 1a, 2, 3 (ventral) read P c, 2, 3
line 7.	P 1, 1a, 2, 2a, 3, 3a, 4, r (dorsal) read P 1, 1a, 2, 2a, 3, 3a, 4, 4a, 5

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